

REMARKS

Claims 1-27 are pending in the present Application.

Claim Rejections - 35 USC § 102

The Examiner rejected Claims 1-17 and 20-27 under 35 U.S.C. 102(a) as being anticipated by Wang et al. (USPN 6,330,170). The Examiner stated:

Claims 1-17 and 20-27; Wang et al disclose a converter circuit (figures 5, 15a, 15b), comprising: an AC-to-DC converter (56, 66), comprising a plurality of first power devices (S1-S4); a resonant DC link (66), comprising at least one power transistor (Sc); a DC-to-AC converter (58), comprising a plurality of second power devices (S5-S8); and DC link lines coupling the AC-to-DC converter, the resonant link and the DC-to-AC converter, wherein the power transistor (Sc) is connected between the DC link lines; and the resonant DC link is operable to clamp an operating voltage of the converter (e.g. abstract; Col. 6 lines 18 and 21; Col. 7 line 14).

Applicant respectfully traverses the rejection regarding claim 1 in the light of the following remarks.

1. Wang does not have:

“a resonant DC link, comprising only one power transistor and a first and a second DC link line; ...; and
DC link lines, coupling the AC-to-DC converter, the resonant link, and the DC-to-AC converter”

FIG. 1 of the application illustrates that an inherent property of the resonant DC link is that is capable of resonating. This is ensured by the presence of capacitor C1 and inductance Lr in FIG. 1 and in the specification.

In contrast, the examiner identified Wang’s voltage clamp 66 as the alleged resonant DC link, shown by shading in FIG. 5. However, clamp 66 only has a power transistor Sc and a capacitor Cc, it does not have an inductor. Because of the lack of an inductor, clamp

66 by itself is unable to resonate. Therefore, Wang's alleged resonant link, clamp 66 is not a resonant DC link.

2. Wang does not have:

“a resonant DC link, comprising only one power transistor and a first and a second DC link line; ...; and
DC link lines, coupling the AC-to-DC converter, the resonant link, and the DC-to-AC converter”

for other reasons as well. FIG. 1 of the application illustrates that in embodiments of the application the AC-to-DC converter, the resonant link and the DC-to-AC converter are distinct, separate blocks, since they are coupled by the still-separate DC link lines.

In contrast, Wang does not have a resonant DC link separate from the AC-to-DC converter and the DC-to-AC converter. Wang's alleged resonant DC link is voltage clamp 66, shown by shading and explicitly pointed at by the examiner. To remedy the lack of an inductor in clamp 66, surprisingly, the examiner points to inductance Lk as part of a putative resonant circuit, even though it is not part of the alleged resonant DC link, clamp 66. This is an inconsistent construction of the claim term.

Moreover, Lk is connected between the four power devices S1-S4 of Bridge I, i. e. the AC-to-DC converter 56, but it is not connected to the capacitor Cc. Therefore, inductance Lk is not part of a separate, identifiable resonant DC link, it is part of the AC-to-DC converter.

To highlight Wang's deficiency:

- If Lk is part of the putative resonant DC link, while it is certainly part of the AC-to-DC converter as well, then the resonant DC link is not distinct and separate from the AC-to-DC converter, as required by the claim. Further, the putative resonant DC link can not be connected to the AC-to-DC converter by the DC link lines, as is also required by the claim, because they share inductor Lk. And conversely,

- If Lk is not part of the putative resonant DC link and only voltage clamp 66 is identified as the resonant DC link, then clamp 66 is not a resonant DC link, since it is incapable of resonating, as required by the claim, for the lack of an inductor.

3. The lack of the required distinctness of the claim elements in Wang became even clearer when the examiner identified blocks 56 and 66 as the AC-to-DC converter and block 66 as the resonant DC link, but did not point to any elements as the putative DC link lines. In the examiner construction of the claim terms:

- (i) the AC-to-DC converter is not distinct from the resonant DC link (as required by the claim), since they share block 66;
- (ii) the AC-to-DC converter is not connected to the resonant DC link by separate DC link lines (as required by the claim), as they share block 66;
- (iii) clamp 66 is not a resonant DC link, as it is not capable of resonating (as required by the claim), since it does not contain an inductor; and
- (iv) no elements were identified by the examiner as the DC link lines (also required by the claim), as no DC link lines can possibly connect the putative Lk-Cc resonant DC link to the overlapping AC-to-Dc converter. This impossibility further underscores the problems of this claim construction.

4. Lk is in fact the “leakage inductance of the transformer seen from the output side” (col. 5, l. 3-4). In other words, in reality there is no separate Lk inductance, it is physically the transformer coil itself. The transformer coil is a natural part of the AC-to-DC converter, which should be distinct from the resonant DC link according to the requirements of the claim.

5. Wang does not have:

“a resonant DC link, comprising only one power transistor and a first and a second DC link line”

for the following reason as well. Wang explains that during the operation of the circuit (col. 6, l. 14-15):

“Referring to FIG. 8C at time $[t_2 - t_3]$: I_3 reaches the load current level at t_2 , and after that, L_k resonates with C_{pn} to bring the buss voltage V_{pn} quickly up to the clamp capacitor voltage V_{Cc} ”

This passage shows that leakage inductance L_k performs a resonating action with the “parasitic capacitance C_{pn} ” (col. 6, l. 2) in one of the intervals of the operation. Thus, in different intervals leakage inductance L_k performs resonant action with different capacitors, C_c and C_{pn} . Therefore it is improper to identify L_k as part of a specific resonant block: it performs resonant actions with different capacitors at different times. It does not constitute, or isn’t an identifiable part of, one specific resonant DC link.

For at least the reasons stated above, claim 1 is patentable, and allowance of claim 1 is therefore requested.

Dependent claims 2-17 depend from claim 1. Since claim 1 has been shown to be patentable, claims 2-17 are also patentable themselves for at least this reason.

The examiner also rejected claims 20-27.

In response, Applicant respectfully traverses the rejection in the light of the following remarks.

Independent claim 20 is a method claim, corresponding to claim 1. It recites, in pertinent part:

“an AC-to-DC converter, a resonant DC link, comprising only one power transistor and a first and a second DC link line, a DC-to-AC converter, and DC link lines, coupling the AC-to-DC converter, the resonant link, and the DC-to-AC converter”

Independent claim 21 recites, in pertinent part:

“an AC-to-DC converter, comprising a plurality of first power devices;
a resonant DC circuit, comprising only one power transistor;
a DC-to-AC converter, comprising a plurality of second power devices; and
a positive DC link and a negative DC link, coupling the AC-to-DC converter,
the resonant DC circuit, and the DC-to-AC converter”

Claims 20 and 21 recite in pertinent part a (i) separate and distinct (ii) resonant DC link, coupled by the DC link lines to the AC-to-DC converter. For at least the reasons stated in relation to claim 1, Wang does not have the claim limitations (i) and (ii). Therefore independent claims 20, 21 and the corresponding dependent claim 22 are patentable at least for these reasons.

The examiner rejected claim 23. In pertinent part, claim 23 recites:

“...the first and secondary power devices have voltage ratings limited by a clamping of a resonant DC link voltage.”

The examiner presented no argument that this claim limitation was present anywhere in Wang. In particular, the terms “rating” or “voltage ratings” were not mentioned in Wang anywhere. In the absence of an explicit demonstration, or a persuasive argument, Applicant concludes that this claim limitation is absent in Wang. At least for this reason claim 23 is patentable.

The examiner rejected claim 24. In pertinent part, claim 24 recites:

“the power transistor is switched on for less than 10 percent of the operating cycle.”

The examiner presented no argument that this claim limitation was present anywhere in Wang. In the absence of an explicit argument by the examiner, Applicant reviewed Wang carefully from this vantage point. Wang’s FIGs. 7, 10, and 12 show timing diagrams for the operation of Wang’s converter. Simple inspection suggests that the power transistor Sc is switched on more than 10 percent of the time. In the absence of any explicit demonstration

or a persuasive argument Applicant concludes that this claim limitation is absent in Wang. At least for this reason claim 24 is patentable.

The examiner rejected claims 25-27. Claims 25-27 are patentable for at least the reasons presented in relation to claim 1 above.

Allowable Subject Matter

The Examiner objected to claims 18 and 19 as being dependent upon a rejected base claim, but stated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In response, Applicant gratefully appreciates that the examiner recognized the patentability of claims 18 and 19. However, in the light of the above arguments, which show that claim 1 is patentable and because claims 18 and 19 depend from patentable independent claim 1, therefore claims 18 and 19 are patentable for at least that reason.

CONCLUSION

In light of the above remarks and with the above amendments, Applicant respectfully submits that all pending claims are in condition of allowance and therefore their allowance is requested. If any of the claims or the supporting arguments require further clarification or discussion, the undersigned is readily available at (415) 772-1200.

No additional fees are required for this amendment. However, the Commissioner is hereby authorized to charge any additional fees, which may be required, or credit any overpayment to Deposit Account No. 50-1597.

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